[54] **SHAPE MODEL GENERATION DEVICE FOR GENERATING SHAPE MODELS WITH A REDUCED NUMBER OF POLYGONS WHILE MAINTAINING QUALITY OF THE TWO-DIMENSIONAL IMAGE OF THE GENERATED SHAPE MODELS**

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[57] **ABSTRACT**

An image generation system having a shape model generation device for generating a set of polygons which approximates a given solid having a curved surface and output vertex coordinates of each polygon in a screen coordinate system. An image generation device is provided for generating images for each polygon on receiving the vertex coordinates, and an image display device displays the generated images. The shape model generation device divides the solid into a set of polygons in a virtual-space, where the number of polygons used for dividing the solid into polygons is minimized while maintaining a high-quality display image. The set of polygons are projected onto a screen based on a designated view point and direction in the virtual-space, and the vertex coordinates of each polygon is transformed into two-dimensional screen coordinates. An edge judgment unit is provided in the shape model generation device for judging whether any side of each screen-projected polygon constitutes a part of an outline of the set of screen-projected polygons. An edge change unit in the shape model generation device generates a new vertex in the virtual-space on any side which constitutes a part of the outline, and the coordinates of the new vertex are transformed into two-dimensional screen coordinates. A polygon division unit is provided for dividing a screen-projected polygon including any side which constitutes a part of the outline into smaller screen-projected polygons at the new vertex.

25 Claims, 24 Drawing Sheets

301 shape model generation device

| shape transformation unit (311) | coordinate transformation unit (312) | edge judgement unit (313) | edge change unit (314) | polygon division unit (315) |

shape model

image generation device (320) → image → image display device (330)